

THE MEMBERS MAGAZINE OF THE NATURAL
HISTORY MUSEUM OF LOS ANGELES COUNTY

Terra

VOL. 14 NO. 3 WINTER 1976



Another Terra First.

The TERRA Portfolio and Pull-Out Poster is another TERRA first. The editors would appreciate your response to this experiment. Additional posters, unfolded, may be purchased at the Natural History Museum Book Shop for \$1.25, plus tax. Mail orders, postpaid, in tube, \$2.20, including tax.

And From Down Under

40 Perry Street,
Papanui,
Christ Church 5,
New Zealand.

The Editor
TERRA MAGAZINE,
Natural History Museum of L.A. County
900 Exposition Blvd.
Los Angeles, California 90007

Dear Sir/Madam,

I recently encountered the Summer 1975 issue of TERRA and was most interested in the article, "The California Bungalow," this architectural style being popular throughout Australasia in the 1920's. If possible I would like to obtain my own copy of this particular issue and was wondering if you could kindly advise me as to how I could do so. Thanking you,

Yours sincerely,
Richard Wolfe

Editor's Note: Every issue of TERRA has produced correspondence from at least one foreign country, sometimes several of them. We have responded to Mr. Wolfe and he will receive his requested issue of TERRA, if he can afford the postage.

Book Review



The finest book ever published on Pacific fishes, **The Marine Game Fishes of the Pacific Coast — Alaska to Ecuador**, by Lionel Walford, has just been reprinted. It was originally published in 1937 with 38 magnificent color plates and the reprint contains these as well as the original quarto format. A new introduction provides additional records and brings the scientific names of the fish species up to date. The original was in limited edition and often brings \$100 or more on the used book market. The color plates alone are more than worth the modest purchase price for a book which also contains a wealth of information on the distribution, biology, and angling for the Pacific game fishes of southern California, Mexico, and Central America. This hardbound reprint is available in the Natural History Museum of Los Angeles County Book Shop.

Thank You

Membership response to *A Mountain Reprieve, Trekking in Nepal*, by Mary P. Goodwin, was gratifying. It is not possible to thank all the people who wrote and telephoned individually, but Terra's editors take this opportunity to say members' appreciation made the project even more satisfying. The small overrun sold out quickly.

About the Cover:

Adult Buckeye butterfly (*Precisicoenia*), photographed in its characteristic sunning position by Darwin Tiemann.



The Members Magazine of
THE NATURAL
HISTORY MUSEUM ALLIANCE
of Los Angeles County
VOL. 14 NO. 3 WINTER 1976

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Take a Butterfly To Lunch

A Guide to
Butterfly Gardening
in Los Angeles

by Julian P. Donahue

Said Buddha to the butterflies: "I thank you, you are my masters. From you I have learned more than from all the writings of the Brahmins."

Although many gardeners have expanded their goals to include the native wildlife in their plans, few in this country have given much thought to encouraging any wildlife other than birds, not to mention the butterflies.

On the other hand, the Europeans are kilometers ahead of us in their appreciation of nature. For example, more than half of all the species of butterflies known to occur in Northern Ireland have been observed at the Drum Manor Butterfly Garden, which measures only 210 feet on a side. Obviously, your butterfly garden might not reach these dimensions, but it can be as small as a single, well-chosen plant.

Over the years butterflies have generally become scarcer in the cities, and they need all the help they can get if they are going to resume their former abundance. This article reviews a few methods, adaptable to virtually any garden, regardless of size, which will increase the number and variety of butterflies, with particular reference to the urban environment of the Los Angeles Basin.

Where have all the butterflies gone? In 1927, Dr. John Adams Comstock, dean of Southern California lepidopterists, wrote about the Senna Sulfur: "This brightly colored and agile butterfly is a familiar sight as it dodges through the gardens and parks of Southern California, in search of the yellow *Cassia* blossoms." And in 1930 Jean Gun-der, in an article on the butterflies of Los Angeles County, had this to say about another butterfly, the Comstock's Fritillary: "A short dirt road leads from the back of the City Nursery to the top of the hills in Griffith Park. By hunting near here at the proper time, many specimens may be taken."

Today, the Senna Sulfur is a rarity in Los Angeles, and Comstock's Fritillary is now

locally extinct, although it still occurs in some surrounding areas. And there are numerous other examples of formerly common butterflies which are now rare or totally absent in the Basin. Why? This question is being posed not only in Los Angeles, but in urban areas throughout the world. To answer the question, a brief review of butterfly biology is in order.

Butterflies (and moths), in the order Lepidoptera, are highly evolved insects. Their life cycle consists of four quite different stages: egg, larva (or caterpillar), pupa (or chrysalis), and adult. Two of these stages, the caterpillar and the adult, require food, although all growth takes place in the larval stage. The caterpillar is like a self-stuffing sausage that gorges itself on leaves or flowers, pausing only occasionally to shed its skin when the "casing" becomes too tight. When growth is complete, the caterpillar sheds its skin one last time, to reveal the pupa, from which the adult, fully-grown butterfly emerges some time later. All butterflies are as big as they are ever going to be, and they do not grow: little butterflies do not become big butterflies. Although they do not grow, adult butterflies require food, in the form of nectar, to provide energy for flight. Some butterflies have obvious preferences for certain types of flowers, but most visit a wide variety of plant species.

The feeding requirements of the caterpillars, however, is a different story. Although some species, like the Painted Lady, consume a broad range of plants, most are much more fastidious. Some, like the Cabbage Butterfly, restrict their diet to the members of one family of plants, while others, such as the Gulf Fritillary, confine their feeding to one or a few very closely related plants.

This foodplant specificity of the caterpillars helps answer the original question, "Where have the butterflies gone?" When the larvae of a butterfly rely on one or a few

species of native plants, and these plants disappear, for whatever reason, the butterfly disappears also. Only when the caterpillars are capable of adapting to another kind of suitable plant, such as an introduced weed or an ornamental plant cultivated by man, can they survive. In most cases of the disappearance of a species, the butterfly was too parochial in its tastes to adapt to another foodplant in time to avoid extinction. Thus, logically, part of the answer lies within the related question, "Where have the plants gone?"

The major cause for the disappearance of butterflies in a given area is almost always habitat destruction. Alteration of the vegetation and elimination of the native plants is accomplished by a variety of natural events, such as fire and flood, but more often as a direct result of man's activities, usually in the name of "growth" or "progress," such as housing construction, paving land to create parking lots and highways, filling of canyons and marshes, grading of hills, and so on. Environmentalists are quick to point out that this habitat destruction is the result of two factors: increased population pressure and the desire to improve the quality of life, both of which exacerbate the demand upon non-renewable resources.

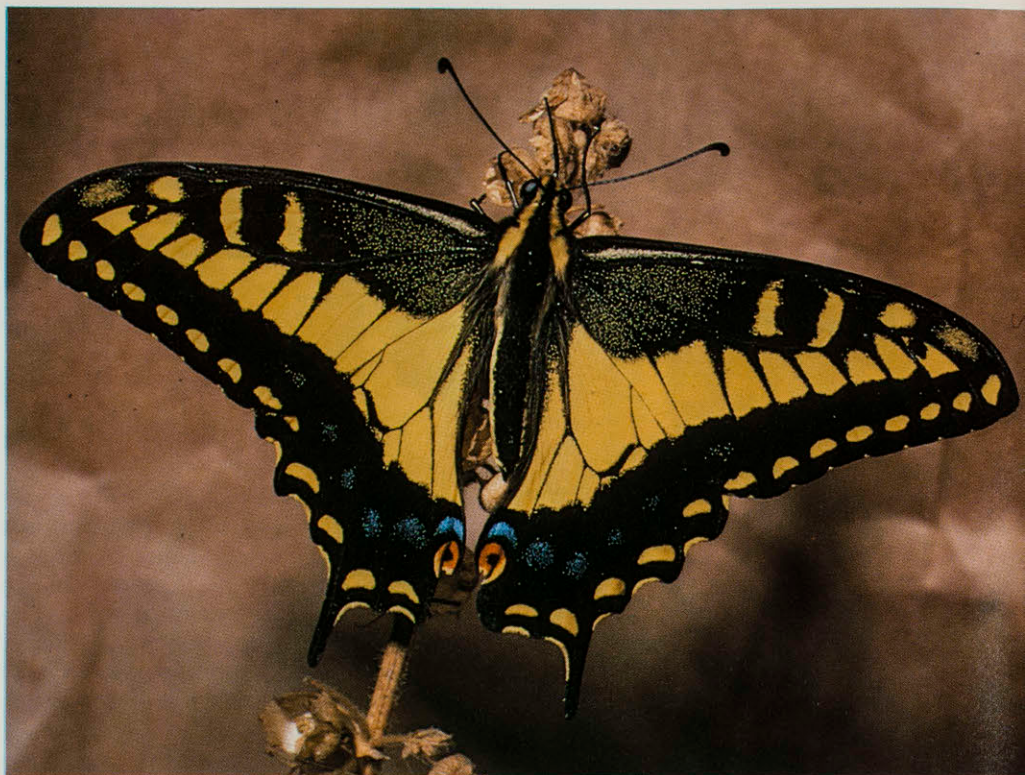
In addition to the loss of foodplants as a result of habitat destruction, other factors have been implicated in the disappearance of butterflies, but the evidence is often difficult to obtain. The indiscriminate or careless use of pesticides (a general term that covers herbicides, fungicides, insecticides, rodenticides, etc.), particularly those which affect a wide variety of "non-target" organisms, undoubtedly has a deleterious effect on the native butterflies and other insects. Pesticide sprays can easily drift away from the plant you are treating, and land on a plant where a caterpillar is busily dining. The effect is the same as if any exterminator came into your house to poison

rats, and accidentally sprinkled a little poison on your dinner plate. He may get the rats, but he may get you also!

Smog has also been implicated in the decline of insect populations: not necessarily the smog one breathes, for insects breathe differently and don't have lungs to damage, but the solid particles of pollution in the air which settle on the leaves being eaten by caterpillars. Have you ever noticed how filthy your automobile becomes when left on the street for a week? This same fallout, containing a number of potentially toxic compounds, is falling on the leaves of every outdoor plant in the Basin. The effect on caterpillars has not, to my knowledge, been studied, but it may be a contributing factor in the decline or disappearance of some species.

Despite the vast despoliation and destruction of native habitat in the Los Angeles Basin, numerous species of butterflies have been able to continue their existence here, albeit sometimes precariously. An example of one endangered survivor is the El Segundo Blue. It has always, so far as we know, lived only on the El Segundo Sand Dunes. As a result of housing and airport construction, the original habitat has now been reduced to a small plot of pristine sand dune owned by Standard Oil of California (which has, at the suggestion of local conservationists, fenced this property to preserve its native character) and a larger expanse of dunes at the end of the runways of the Los Angeles International Airport. Were it not for the airport, the dunes would be covered with homes by now. But due to safety and noise factors, that portion of the dunes is now protected by a fence, and a number of homes that had been built there have been vacated, thus creating the potential for more natural dune area than existed a few years ago. The El Segundo Blue, at the time of this writing, is being considered as one of the first butterflies to be placed on the List of Endangered Species, a list of plants and animals, compiled by the Federal Government, which are deemed to be in immediate danger of extinction unless protective measures are taken.

Miraculously, the majority of butterflies remaining in the Los Angeles Basin (and many more species occur in the adjacent foothills and surrounding mountains) have been able to survive, and even flourish, in harmony with man. There are three reasons for their successful survival: they inhabit relatively undisturbed habitats, their larvae feed on weeds, or their larvae feed on plants which man has introduced or encouraged for one reason or another. These



The Anise Swallowtail, one of the most spectacular California butterflies, has the potential to be much more abundant in Los Angeles because its caterpillars feed on a common weed. (Photo by Greg R. Ballmer)

Larva of the Anise Swallowtail on common fennel, the preferred local foodplant. (Photo by Julian P. Donahue)



butterflies, which have demonstrated their ability to overcome adversity or adapt to new conditions, are obviously the best candidates for encouragement by means of suitable gardening techniques.

NECTAR SOURCES

As pointed out earlier, butterflies need food both as caterpillars and as adults. Let us first look at the kind of flowers which attract the butterflies already in our neighborhood, before we proceed with seeing what can be done to increase the number and variety of species in the garden.

Unfortunately, there is very little information as to which flowers in Los Angeles are attractive to butterflies, and even less information on how specific the attraction is for a given kind of butterfly. In other words, do Gulf Fritillaries prefer one flower, while the Fiery Skippers tend to prefer another? If this information is gathered by you, the butterfly gardener, and disseminated to other gardeners in Los Angeles, we can build a body of knowledge sufficiently informed so that certain plants can be "prescribed" for gardeners who want, for example, more Marine Blues and fewer Cabbage Butterflies.

Despite the lack of detailed observations, there are a number of plants which attract so many butterflies that it has been impossible not to notice. For detailed information on the cultivation of these plants, such as soil, sun, and moisture requirements, consult the *Sunset Western Garden Book* (see references), or your favorite gardening manual. Generally, red, orange, lavender, and lilac seem to be the colors most attractive to butterflies.

Lantana (*Lantana*). A nondemanding, easily-grown plant, considered a weed by some. Perhaps the most common butterfly plant in Los Angeles. Of the many varieties available, those with lilac and lavender flowers seem to be preferred by butterflies, with the Fiery Skipper perhaps favoring the orange varieties.

Butterfly Bush (*Buddleia*). Of the two species readily available, *B. davidii* is perhaps better for butterflies, as it blooms in mid-summer, when more butterflies are on the wing than in the spring, when *B. alternifolia* is in flower. Many varieties are available, differing mostly in the color of the flowers (a good opportunity for experimenting to find the best color for butterflies). Other species, such as *B. asiatica*, *B. globosa*, and *B. salvifolia* are rare, but may be worth the effort to find. *Buddleia* attracts the larger butterflies, such as the Western Tiger Swallowtail and West Coast Lady.

Marigold (*Tagetes*). There are many varieties, sizes, and colors, all easily cultivated



A freshly-emerged Western Tiger Swallowtail prior to its first flight, at rest above its empty chrysalis. (Photo by Roy Pence)

5

The larva of the Common White, feeding on a native species of mustard. (Photo by Greg R. Ballmer)



and virtually care-free. Particularly attractive to skippers, with orange-flowered varieties apparently preferred.

Zinnia (*Zinnia*). This gardener's favorite, available in numerous colors, varieties, and sizes, is attractive to many species of butterflies.

Cape Plumbago (*Plumbago auriculata*), which blooms from March to December (year-round in frost-free areas), is particularly attractive to the Marine Blue, the Common Hairstreak, and other blue butterflies.

Mexican Fire Plant (*Euphorbia heterophylla*), an annual that resembles a miniature poinsettia, is especially attractive to the Marine Blue and the Pygmy Blue.

Wild Buckwheat (*Eriogonum*). If native plants are your specialty, this is the plant. Particularly attractive to the blues and, in the foothills, Mormon Metalmarks, whose larvae also feed on this plant. *E. parvifolium* is the larval foodplant for the El Segundo Blue, also serving as a nectar source for the adults of this and other blues.

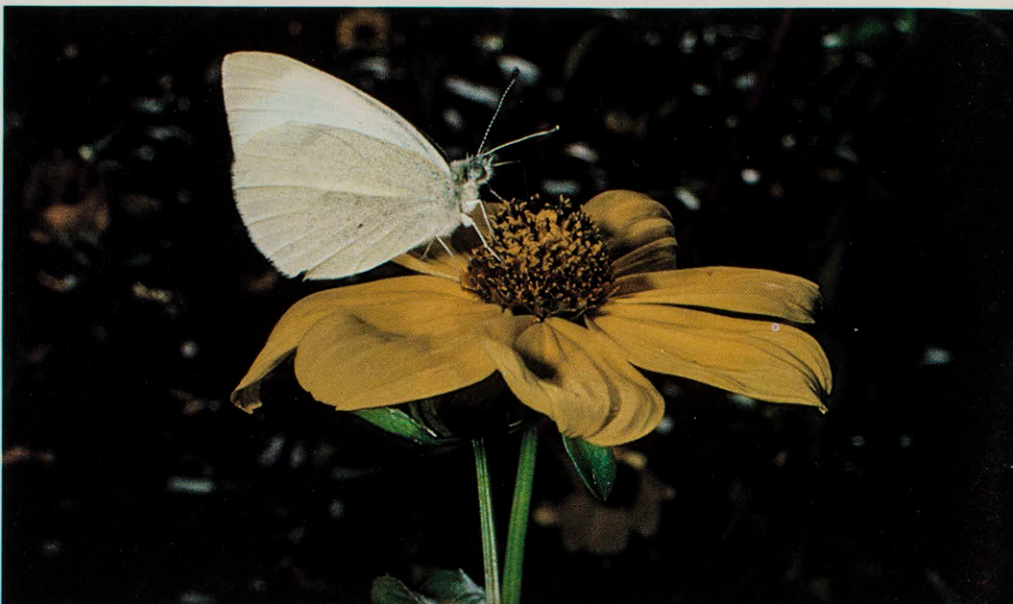
Milkweed (*Asclepias*). There are many species, but few are native to the Los Angeles Basin (*A. eriocarpa* has very pubescent leaves, which may discourage feeding by Monarch larvae). Orange-flowered exotics are probably the best attractants for butterflies (*A. tuberosa*, the "butterfly weed" of the eastern U.S.A.; *curassavica* of the tropics, which has escaped from cultivation in parts of the Santa Monica Mountains).

Glossy Abelia (*Abelia grandiflora*), with small but showy flowers during the summer and early fall, has been observed to be attractive to Fiery Skippers, Monarchs, and Western Tiger Swallowtails. Several varieties of this plant, differing in growth form, are available.

IF YOU REALLY WANT BUTTERFLIES, YOU GOTTA HAVE WORMS!

Remember last summer? You never did get around to digging up that big fennel weed on the corner of your lot, and you never quite mustered the energy to rip out the passion vine that threatened to obscure your favorite hedge. But, somehow, you always found a lame excuse not to weed and prune as much as you thought you should. You can now replace your guilt with pride, for a "lazy gardener" is one of the best friends of wildlife — including butterflies.

Without realizing it, your procrastination set the dining table for two of Los Angeles' most striking butterflies — the Anise Swallowtail and the Gulf Fritillary. "But," you protest, "I never saw any butterflies on those



The Cabbage Butterfly, imported from Europe, has established itself as a common resident of Southern California. (Photo by Greg R. Ballmer)

The cryptically colored larva of the Cabbage Butterfly, here resting head downward on the stem of its foodplant, usually escapes casual observation. (Photo by Darwin Tiemann)



weeds!" Perhaps you didn't — but what about the caterpillars? Yes, you recall, now, the passion vine was covered with spiny "worms" all summer, turning the leaves to confetti as they merrily munched on the result of your laziness. You may have also noticed a strikingly banded caterpillar grazing on your fennel. But, in all likelihood, you did not associate those caterpillars with the silver-spotted orange and black butterflies that stirred your interest as they flitted in and out of the garden, or the large black and yellow butterfly that occasionally skimmed across the yard.

Unfortunately, caterpillars are usually treated as objects of scorn at the least, and the targets of an eradication attempt at the most. But a close, unemotional inspection reveals that, in their own way, caterpillars are every bit as handsome as the adult butterflies they later become. The color of their skin may match that of their foodplant, or it may be brightly patterned to warn potential predators of their unpalatability. Their body may be smooth and virtually naked, or covered with fine pubescence, or adorned with bizarre knobs and spines. Each species is different, and the variety is virtually endless. In fact, the larvae of many species have never been discovered, and remain unknown to science.

Obviously, if we truly want to manage our gardens to encourage butterflies, we have to provide not only a nectar source to sustain the adults, but the proper plants to nourish the caterpillars. Without the caterpillars, there will be no butterflies. The gardener thus has three options to managing his property for butterflies: (1) tolerate the caterpillars which have already found favor on his plants; (2) allow weeds to remain wherever possible, perhaps just in a corner of the garden devoted to that purpose; (3) add known larval foodplants, in order to attract additional species of butterflies.

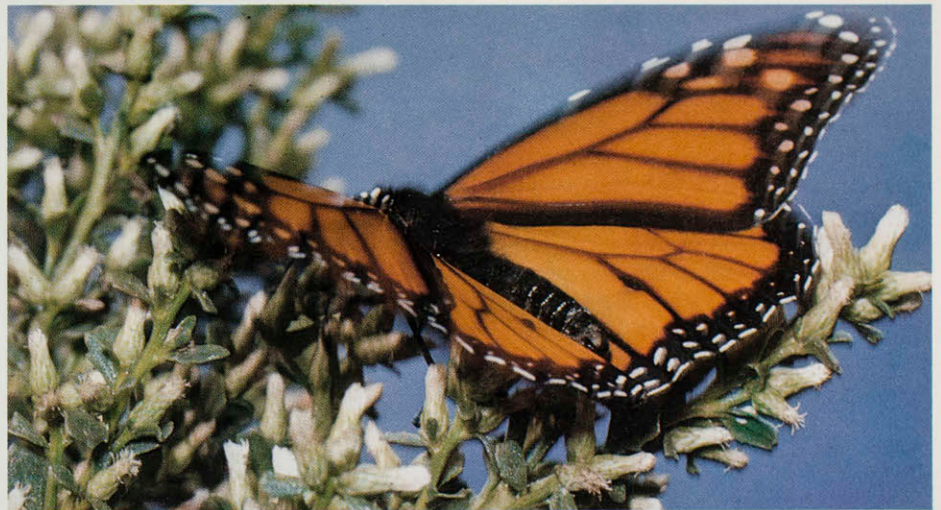
The accompanying "Planting Guide for Los Angeles Butterflies" lists 19 species of butterflies which are common, or potentially common, in the Los Angeles Basin, along with their local larval foodplants and the size, color, and flying season of the adult butterflies. Elsewhere, these widely distributed butterflies may feed, in the larval stages, on other plants, but we have selected here the known or most likely local foodplants, all of which are easily cultivated or which even occur as weeds. Several of these butterflies deserve special emphasis.

THE "BIG 6" WEED FEEDERS

The weed-feeding caterpillars are perhaps the easiest to encourage, for we only have to continue our conservationist "lazy gardener" techniques. In fact, you



Once more common in Los Angeles, the Cloudless Sulfur is now a rarity which might become more abundant if there were more of its *Cassia* foodplant. This specimen was photographed in southern Arizona by Greg R. Ballmer.



The Monarch, one of the most familiar of North American butterflies, spends the winter along the Southern California coast. (Photo by Darwin Tiemann)



Although the larva of the Monarch usually feeds on the leaves of milkweed, this one chose to dine on the flowers. (Photo by Darwin Tiemann)

may even want to go a step further, and encourage more weeds (and hope that the neighbors don't notice).

Without doubt the king of the Los Angeles weed feeders is the striking Anise Swallowtail, whose larvae have very successfully adapted to feed on common fennel, an introduced weed from southern Europe which is also cultivated for its seeds, used to season bread and pudding, and for its leaves, used as a garnish for salads and fish. This plant flourishes in vacant lots and hillsides, where these neglected weeds are frequently populated with Anise Swallowtail caterpillars. Potted patio plants have even sufficed to induce a female to lay her eggs. The McCurdy Nature Study Center has sought to increase the abundance of this plant by distributing seedlings to school children, and offers fresh seeds for home planting, while they last (telephone 794-1866).

The Cabbage Butterfly, introduced to North America about 1860 in Quebec, has gradually spread across the continent to claim Los Angeles as one of its habitats. The cryptically colored larvae of this butterfly feed on a wide variety of cruciferous weeds (mustard, wild radish, etc.), as well as on cultivated members of the mustard family (cabbage, nasturtium, etc.).

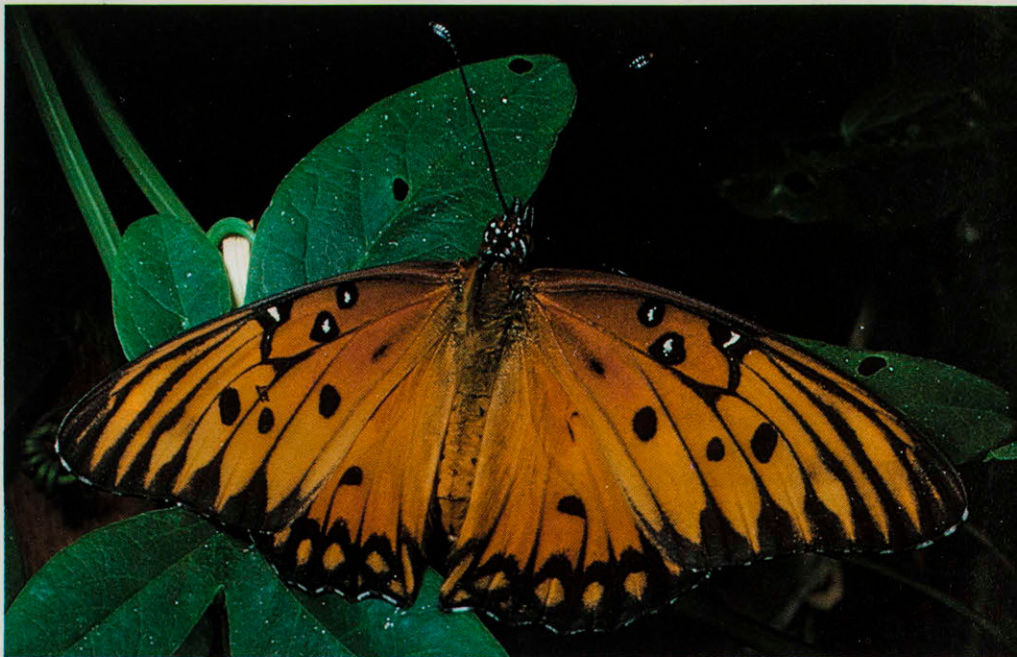
Cheeseweed, a familiar vacant-lot member of the mallow family, serves as the foodplant for two quite different but common local butterflies: the West Coast Lady and the Common Hairstreak. In years when the Painted Lady migrates here from Mexico, its larvae will also feed on this plant.

Caterpillars of the Pygmy Blue, the smallest of North American butterflies, feed on plants in the goosefoot family, most notably pigweed and Australian saltbush. These plants volunteer readily, and thrive on inattention.

The Fiery Skipper, the last of the "Big 6," is an active, orange and brown butterfly whose larvae feed on a variety of grasses. Surprisingly enough, little is known of the specific foodplants of this common skipper, and documented records would be most instructive. In Los Angeles, it is definitely known to feed on Bermuda and St. Augustine grasses.

THE ADAPTABLE NATIVE

The Marine Blue is a real charmer, and one of the most common butterflies in my own embryonic butterfly garden. Despite its small size, the bright blue upperside and the zebra-striped underside never fail to please me. This is one of those butterflies whose larvae feed on the flowers of a wide variety of plants, both native and intro-

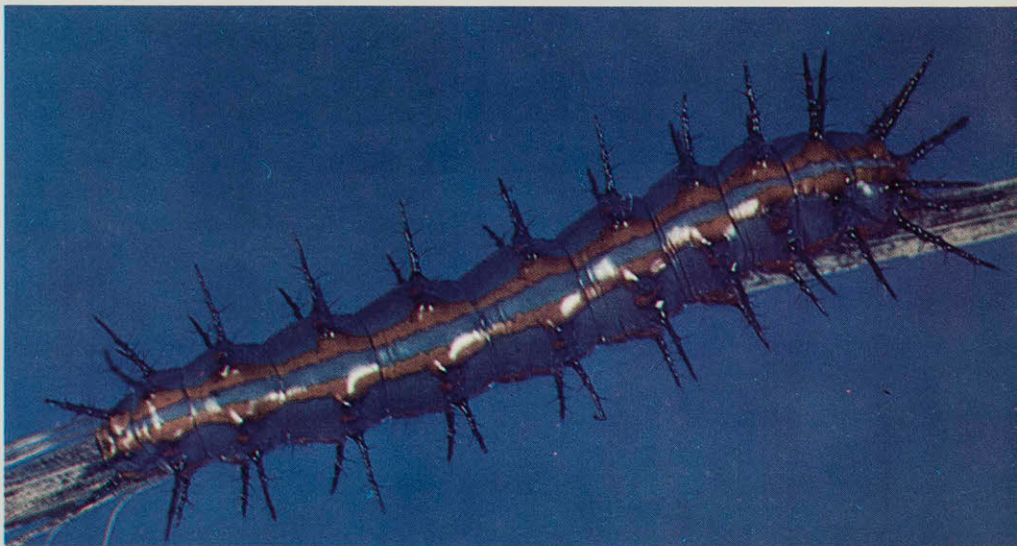


The Gulf Fritillary is one of our most abundant and colorful urban butterflies, despite the fact that it is a "foreigner." (Photo by Charles L. Hogue)



The undersides of the wings of the Gulf Fritillary, with their silvery white spots, are quite different from the uppersides. (Photo by Alpha James)

The bright colors and menacing spines of the Gulf Fritillary caterpillar are harmless to humans, but they help "advertise" the fact that the caterpillar is distasteful to birds and other predators. (Photo by Darwin Tiemann)



duced. With the decline of the native plants, it has adapted quite well to several cultivated plants, notably cape plumbago and wisteria. You may never notice the small slug-like caterpillars, but it is difficult to overlook the energetic activity of the adult butterfly.

THE ESTABLISHED FOREIGNER

Enigmatically, one of the most common, colorful butterflies of Los Angeles has not always been here. One explanation for its presence is that the Spanish missionaries may have accidentally brought it with the passion vine, whose name is derived from the manner in which the flower parts symbolize elements of Christian history and faith. However it got here, the Gulf Fritillary is a welcome immigrant which has adapted itself so well to the local environment. The striped, spiny caterpillars feed only on various species of passion vine, which are tropical plants native to Latin America. The gardening books emphasize the susceptibility of some varieties to feeding damage by caterpillars — rather than avoid those varieties, they are just the ones to cultivate if you want more butterflies. *Passiflora caerulea* seems to be more susceptible to feeding, hence the species to plant to provide food for the caterpillars of this spangled butterfly.

THE VANISHING VISITORS

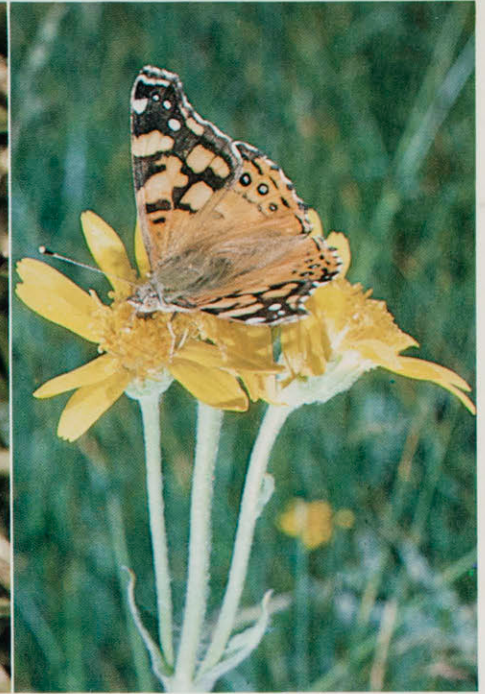
Two yellow butterflies, the large Cloudless Sulfur and the smaller Nicippe Yellow, both of which feed on native and ornamental senna (*Cassia*), have become noticeably less abundant in recent years. Neither species appears capable of surviving our mild winters. Instead, the local population is established anew each spring by migrants from the south. A sighting or capture of the Cloudless Sulfur is today an event worth noting, but which used to be a fairly frequent occurrence. The reason for the decline of these two butterflies is unknown. Perhaps not enough of their *Cassia* foodplant is grown today, perhaps the larvae were too susceptible to smog fallout on their food. But there are definite records of the larvae feeding on the leaves of cultivated *Cassia* in the Basin. Who knows, perhaps the establishment of more foodplant may result once more in a greater abundance of these butterflies in Los Angeles. Whether or not they increase the population of butterflies, the plants themselves, with their graceful form and golden yellow flowers, are certainly a colorful addition to the landscape.

REARING AND RELEASING

Some people want do even more for the local butterflies, in addition to planting larval and adult foodplants. After all, in your gar-



The Painted Lady butterfly occurs on all continents except Antarctica, and sometimes experiences huge population explosions and migrations. Darwin Tiemann photographed this one sipping nectar from *Baccharis pilularis* ssp. *consanguinea*.



The West Coast Lady is a close relative of the Painted Lady, but occurs only in western North America. (Photo by Greg R. Ballmer)

The caterpillar of the West Coast Lady lives in a silken "nest" which it constructs on the leaves of cheeseweed, a common weed in vacant lots and disturbed areas. (Photo by Darwin Tiemann)



den the caterpillars must survive the same struggle for survival as elsewhere — they must contend not only with their natural predators, parasites, and diseases, but with unknowing (or uncaring) gardeners who kill every “bug” on sight, or who carelessly allow pesticides to drift onto the very susceptible caterpillars. If you have the time and interest, butterfly culture can be a very rewarding and educational experience. Furthermore, if the butterflies are reared in protective cages, your “yield” will be much greater than that in nature, for you will be able to provide protection from enemies. To describe the rearing process, and the numerous techniques involved, would take another article. If you are interested, you will find pointers in several of the references at the end of this article (particularly Hogue, Dirig, and Crotch).

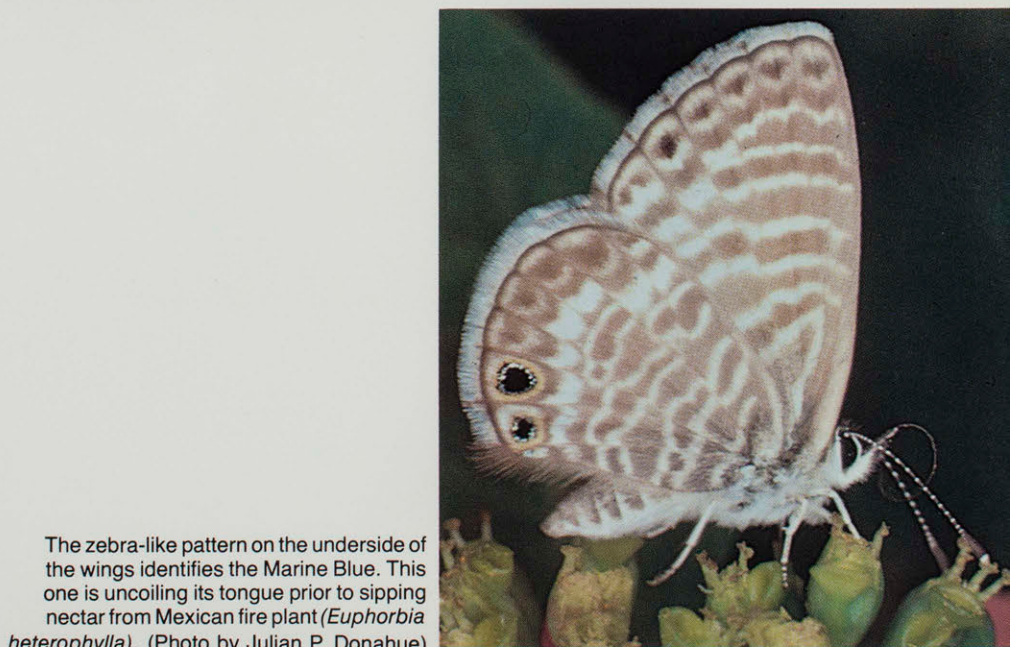
What if you decide to release the native butterflies you have reared? This is certainly commendable, but don't expect them to stay in your own back yard. Remember that butterflies traverse a considerable area in their search for nectar sources and plants on which to lay their eggs. Furthermore, many of them are territorial in nature, just as most birds are, so that a given area will only sustain a limited number of adult butterflies. However, by releasing specimens you will allow the “surplus” in your area to migrate to other areas in the neighborhood where they may establish new colonies. And, since the butterflies live, as adults, for anywhere from about two weeks to several months, depending on the species, you will have certainly contributed some color to your neighborhood while they are on the wing.

Some butterfly fanciers have been tempted to rear, then release, colorful exotic butterflies, with the intention of adding even more variety to the local butterfly situation. And in an area like Los Angeles, which needs all the butterflies it can get, the thought is even more appealing. But, with a little reflection, we can realize the potentially grave hazards associated with such a releasing program. A butterfly, in its native habitat, has evolved in association with a complex assemblage of foodplants, predators, parasites, diseases, and other butterflies — all of which hold the population to a relatively stable level. But the butterfly (or any other insect, for that matter), transported to a foreign area without its concomitant population regulators, not only has the potential of undergoing a population explosion in the absence of natural control agents, but it also has the potential to adapt to new foodplants, which may be of considerable economic value to man. To

The Common Hairstreak, abundant in urban Southern California, sports two slender, threadlike tails on its hind wings. (Photo by Greg R. Ballmer)



The slug-like caterpillar of the Common Hairstreak is difficult to observe because of its small size and cryptic coloration. This one is feeding on hibiscus, one of its favorite urban foods. (Photo by Greg R. Ballmer)



The zebra-like pattern on the underside of the wings identifies the Marine Blue. This one is uncoiling its tongue prior to sipping nectar from Mexican fire plant (*Euphorbia heterophylla*). (Photo by Julian P. Donahue)

invite these foreigners to our shores, despite one's highest esthetic motives, is only to invite the possibility of an ecological disaster. It is equally possible that an introduced species of butterfly may be able to "out-compete" a native species and cause its extinction.

There are numerous examples of such economic calamities, although very few of them involve butterflies. The Gypsy Moth, originally brought to Massachusetts for research as a potential source of silk, escaped from the laboratory and now regularly defoliates a large part of the hardwood forests of the eastern United States. The Cereal Leaf Beetle, an accidental introduction, has caused millions of dollars of damage to the grain industry in the Midwest. And the list goes on. Two Los Angeles butterflies are exotic introductions, and both are considered pests by some — depending on whether you are trying to raise cabbage, or whether you want unblemished leaves on your passion vine. Both have managed to thrive here, despite being regular targets of insecticides.

And there is one other reason for not importing and releasing exotic butterflies: it's illegal. To transport or import live insects in California requires a permit from the State Department of Food and Agriculture, which is charged with the protection of our billion-dollar agricultural industry. The Department is understandably reluctant to issue permits except under the most unusual circumstances. Federal law also regulates the interstate shipment of live insects.

So if you want to see exotic butterflies, the ecologically responsible way to do it is to go visit them in their native habitat — don't bring them to you.

GUESTS CAN BECOME PESTS

In your effort to encourage butterflies (and remember, this implies caterpillars, too), you may have been more reluctant than usual to apply your favorite pesticides in and around the garden. Or you may have realized for the first time that those ugly worms will turn into airborne jewels if left unmolested. But, depending on your temperament and level of tolerance, problems may develop. Jack Thomas and Richard DeGraaf, writing in *Gardening With Wildlife*, have stated the case eloquently: "Although the problems are relatively rare and generally minor, as backyard wildlife managers we must strive for tolerance of a reasonable amount of challenge. The rub, of course, comes in deciding what is reasonable and what simply cannot be tolerated. Before we are qualified to make such decisions there is an important



The row of metallic-crowned spots on the edge of the hindwing is characteristic of the Pygmy Blue, North America's smallest butterfly. (Photo by Greg R. Ballmer)

Caught in the act! A mating pair of the Acmon Blue (male on the left), photographed on the buckwheat foodplant by Charles L. Hogue.



Wild buckwheat serves a dual role as a larval foodplant and as a nectar source for the Acmon Blue. (Photo by Greg R. Ballmer)

philosophical step we must take: the step from thinking of ourselves as users of nature to realizing that we are an integral part of nature. This is an enormous step, yet it is requisite not only to successful wildlife management, but ultimately to man's own survival in the natural world."

Just as a "weed" is a plant which is out of place, a "pest" is an insect doing something you don't want it to do. If the insects seem to be assuming the status of pests, then by all means it is your prerogative to do something about it. After all, they are your plants. But insect control is a complex process, involving not only the pest itself, but all the natural predators and parasites that have been reducing the pest population without your intervention. Many control measures affect not only the pest, but a host of other harmless insects associated with it, and other perfectly benign inhabitants of your garden. Insect control should be undertaken with great deliberation. Consult the County Agricultural Commissioner or your County Agent for the latest control recommendations, and be sure to read and follow the recommendations on the label of the recommended pesticides.

One final thought. Although butterflies and moths are great travelers, and often fly long distances in search of appropriate foodplants, it may take some time before they discover the banquet you have prepared for them. This is especially so if your garden is an isolated oasis some distance from other suitable foodplants. Your chance of early success becomes greater as the quantity of available foodplant increases, over as wide an area as possible. To put it another way, the more butterflies your neighbors have, the more you will have. Obviously, it is to your best interest to encourage your neighbors to adopt gardening practices conducive to stabilizing or increasing the local butterfly population.

If you are already blessed with an abundance of butterflies, you must be doing something right! This article may help you recognize specifically how you have induced the butterflies, so that you can continue the same practices, and it may give you a few ideas for attracting an even greater variety of species. The author would like to know of your successes (and even failures). □

Julian P. Donahue is an Assistant Curator of Entomology at the Natural History Museum of Los Angeles County, where he is in charge of the collection of butterflies and moths. His first contribution to TERRA was "Focus on Rincón: an untamed corner of the rainforest."



A female Fiery Skipper at rest, with the front and hind wings held at different angles, characteristic of all members of this subfamily. (Photo by Laurel G. Woodley)

**A
PORTFOLIO
AND
PULL-OUT POSTER
OF LOS ANGELES
CATERPILLARS**

and

**A PLANTING GUIDE TO LOS ANGELES
BUTTERFLIES**



Organizations
and
Clubs Devoted
to
Butterflies

Books
and
Publications
About
Butterflies

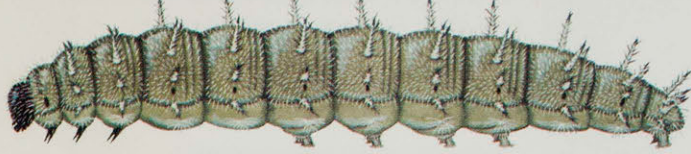
PORTFOLIO OF LOS ANGELES CATERPILLARS



Western Tiger Swallowtail
(*Papilio rutulus*)



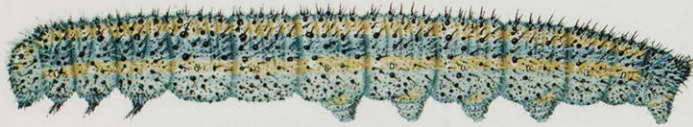
Painted Lady
(*Cynthia cardui*)



West Coast Lady
(*Cynthia annabella*)



Buckeye
(*Precis coenia*)



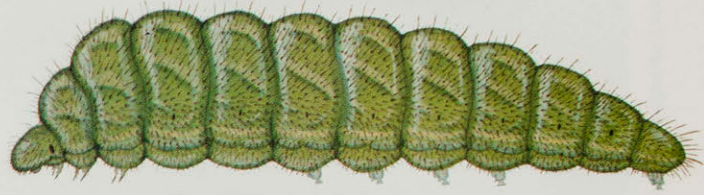
Common White
(*Pieris protodice*)



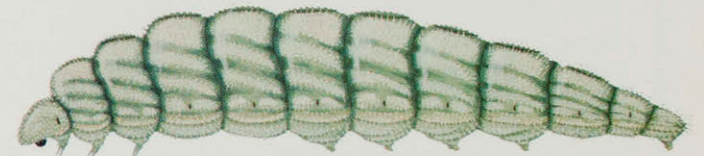
A PLANTING GUIDE TO LOS ANGELES BUTTERFLIES

by Julian P. Donahue

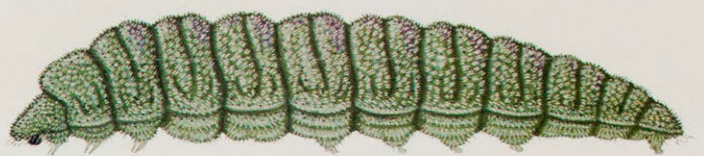
Name	Adult Size	Adult Colors	Adult Season	Local Larval Foodplant	Remarks
Anise Swallowtail (<i>Papilio zelicaon</i>)	large	yellow & black	Feb.-Nov.	common fennel; native umbelliferous plants; occasionally on <i>Citrus</i>	Fennel easily grown; a common weed in vacant lots. Potted plants often successful.
Western Tiger Swallowtail (<i>Papilio rutulus</i>)	large	yellow with black stripes	March-Sept.	sycamore; willow; poplar; cottonwood; possibly birch, cherry, avocado	The largest butterfly in Los Angeles.
Common White (<i>Pieris protodice</i>)	medium	white	year-round	native and introduced crucifers (mustards, cabbage, nasturtiums, radish, etc.)	Most common in late spring.
Cabbage Butterfly (<i>Pieris rapae</i>)	medium	white	year-round	native and introduced crucifers (as above), especially wild mustard	Occasionally a "pest" on cultivated mustards (cabbage, kale, kohlrabi, radish, nasturtium, etc.).
Nicippe Yellow (<i>Eurema nicippe</i>)	small	orange-yellow	year-round	introduced species of <i>Cassia</i> (senna)	Most common April-Sept. Common in Los Angeles until about 1960.
Cloudless Sulfur (<i>Phoebis sennae</i>)	medium large	yellow	Feb.-Dec.	introduced species of <i>Cassia</i> (senna)	Formerly abundant, now rare. Apparently not able to survive the winter — migrants colonize anew each spring. More widespread planting of <i>Cassia</i> may increase this and preceding species.
Monarch (<i>Danaus plexippus</i>)	large	orange & black	year-round	various species of milkweed (<i>Asclepias</i>)	More common in coastal & foothill areas. Adults overwinter along the immediate coast, roosting in large trees (especially eucalyptus).
Gulf Fritillary (<i>Agraulis vanillae</i>)	medium	reddish-orange; silver spots on underside	year-round	passion-vine (<i>Passiflora</i>)	Least common in winter. <i>P. caerulea</i> appears to be the preferred species. Abundant, easily reared, perfect for classroom demonstrations.
Mourning Cloak (<i>Nymphalis antiopa</i>)	medium	black with yellow border	year-round	elm; willow; possibly birch, poplar	Larvae in communal nest in early stages, sometimes "pests" on elm trees. Adults overwinter in attics, garages, etc., flying about on warm sunny days; territorial; perch on prominent objects (including upraised fingers!).
Red Admiral (<i>Vanessa atalanta</i>)	medium	dark brown & red, with white spots	year-round	Baby's Tears (<i>Soleirolia soleirolii</i>)	Generally uncommon in the Basin. In other areas, feeds on hops and native nettles.
Painted Lady (<i>Cynthia cardui</i>)	medium	brown & orange checkered	Feb.-Sept.	thistle, mallow, nettles	Millions of adults migrate north from Mexico in some wet springs; larvae from these feed on a wide variety of plants.
West Coast Lady (<i>Cynthia annabella</i>)	medium	brown & orange checkered	year-round	cheeseweed (<i>Malva parviflora</i>)	The foodplant is a common weed in urban vacant lots.
Buckeye (<i>Precis coenia</i>)	medium	mostly brown, with "eye-spots"	March-Nov.	Plantain (<i>Plantago erecta</i> , <i>P. lanceolata</i>); snapdragon, <i>Mimulus</i> ; penstemon	Uncommon, but a colorful species to encourage; adults are pugnacious defenders of their territory.
Common Hairstreak (<i>Strymon melinus</i>)	small	brown above, gray below; hindwing with threadlike tails	Feb.-Nov.	cheeseweed and other <i>Malva</i> ; flowers of cultivated hibiscus	Adults abundant in urban areas in summer & fall, readily attracted to nectar sources.
Marine Blue (<i>Leptotes marina</i>)	small	blue above; banded gray & white below	year-round	Cape Plumbago (<i>Plumbago auriculata</i>); wisteria (chiefly buds and flowers)	The urban foodplant is also a good nectar source. Elsewhere, larvae feed on wide variety of plants.
Pygmy Blue (<i>Brephidium exilis</i>)	small	blue; underside with silver-crowned marginal spots	year-round	Lamb's Quarters or pigweed (<i>Chenopodium</i>); Australian saltbush (<i>Atriplex semibaccata</i>)	Smallest North American butterfly. Often overlooked, but a delight to behold. Foodplants are common weeds.
Acmon Blue (<i>Plebejus acmon</i>)	small	blue (male), brown (female); red border on hindwing	Feb.-Oct.	<i>Lotus scoparius</i> & other <i>Lotus</i> ; <i>Eriogonum</i> , <i>Astragalus</i>	Spring females with some blue on wings.
El Segundo Blue (<i>Shijimiaeoides battoides allyni</i>)	small	blue above; underside with large, square black spots	July-Aug.	Buckwheat (<i>Eriogonum parvifolium</i>)	Candidate for list of Endangered Species at time of writing. Only occurs on El Segundo sand dunes. Propagation of native foodplant in immediate coastal area of El Segundo and Playa del Rey may benefit this local subspecies.
Fiery Skipper (<i>Hylephila phyleus</i>)	small	orange & brown (females browner)	April-Dec.	various lawn grasses: Bermuda grass, St. Augustine grass, etc.	Very abundant on urban lawns. Larva inconspicuous, feeding at base of plant.



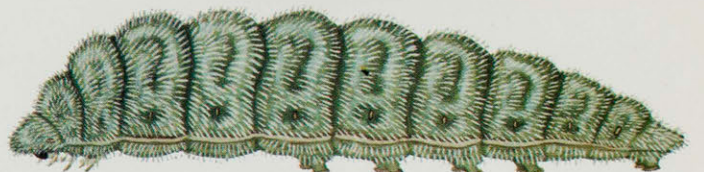
Common Hairstreak
(*Strymon melinus*)



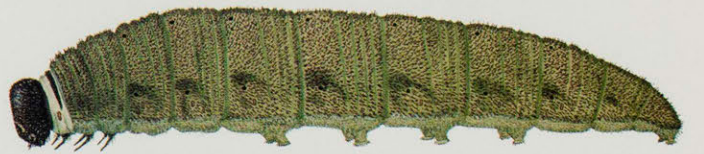
Marine Blue
(*Leptotes marina*)



Pygmy Blue
(*Brephidium exilis*)



Acmon Blue
(*Plebejus acmon*)



Fiery Skipper
(*Hylephila phyleus*)



Milkweed



Cassia



Wisteria



Passion Vine

ETHNIC ARTS SHOP

Butterflies



Top Left: Butterfly pin from the People's Republic of China. Sterling silver filigree work with a gold wash, set with jade and various-colored enamel work. — \$63.00.

Top Center: Silver butterfly pin with a gold wash and jade. Made in Taiwan. — \$6.00.

Top Right: Silver butterfly pin from Mexico. — \$7.50.

Center: Zuni Indian butterfly bracelet made by Rosita Wallace. Butterfly inlay with mother of pearl, turquoise, jet and coral; flowers also coral and turquoise. — \$450.00.

Lower Left: From the People's Republic of China, sterling silver pin with gold wash and cloisonné. — \$26.00.

Lower Center: Zuni ring set with turquoise and coral. — \$26.00.

Lower Right: Silver butterfly ring with abalone shell. Made in Mexico. — \$5.50.

Other Butterflies in the Ethnic Arts Shop:

People's Republic of China:

Large antique silver necklace \$95.00
Antique carnelian necklace with silver butterfly \$70.00
Silk embroideries, old and new \$16.00-\$75.00
Sterling and gold wash enamel and turquoise rings \$15.00
Woven baskets \$3.00-\$5.00

Mexico:

Silver rings, bracelets and pins \$4.00-\$10.00

India:

Antique gold washed silver filigree pin \$20.00

U.S.A.:

Pewter belt buckles, boxes, pins, bracelets, lockets and pendants \$1.50-\$5.00
Hand-crafted Art Nouveau style pendants of Butterfly Lady \$14.00 and \$40.00
American Indian rings, turquoise and coral \$9.00 and \$45.00

Kashmir:

Painted boxes and eggs \$10.00 and \$12.50

Tibet:

Silver filigree pin \$9.00

Sweden:

Pewter pin \$8.50 and \$9.00

BOOK SHOP

Thomas C. Emmel, **Butterflies**, Pub. Alfred A. Knopf — \$29.95.

Thomas C. Emmel and John F. Emmel, **Butterflies of Southern California**, Pub. Los Angeles County Museum of Natural History — \$4.00.

Robert Goodden, **All Colorbook of Butterflies**, Pub. Octopus — \$3.98.

William Howe, **The Butterflies of North America**, Pub. Doubleday — \$39.95.

Also available, books including sections on butterflies:

Donald J. Borror and Richard E. White, **A Field Guide to the Insects**, Pub., Houghton-Mifflin, Hardcover — \$6.95; softcover — \$5.95.

Charles L. Hogue, **Insects of the L. A. Basin**, Los Angeles County Museum of Natural History — \$6.00

THE OLD PROSPECTOR



by Gary F. Kurutz

That classic symbol of California — the Forty-Niner — is often depicted as a rough-hewn, weather-beaten man panning for gold in a muddy stream. The prospector shown here is perhaps the most popular picture in the Natural History Museum of Los Angeles County's collection of historic photographs and is often used to portray the typical California argonaut. There is, however, a hidden story to this charming photograph.

Obviously, the print embodies everything a historian, writer, or museum curator could desire — a face with character, shabby clothing, muddy shoes, and the subject is squatting over a stream holding the ubiquitous wash pan. In an instant, the viewer is transformed back to the days of '49. One can imagine himself working under the hot summer sun in the Mother Lode hoping to wash out of the gravel a few particles of

color. Because of the romantic quality captured by the photographer, this prospector has had wide appeal in countless museum exhibitions, pamphlets, textbooks, and scholarly accounts. This popular photograph has also been copied by artists in their efforts to depict the Gold Rush. Even today, it serves as the focal point of an exhibit in a prominent western museum.

The truth is, however, that this rugged gentleman is not a Forty-Niner at all. He is not panning for gold in the Mother Lode but is washing gravel of the Colorado River in Arizona.

Furthermore, this photograph was not made by a pioneer daguerreotypist but by a Pasadena writer and teacher, George Wharton James. This picture was not taken in 1849, but in 1898, or thereabouts. In short, the print so often used to represent the glorious Forty-Niners is wrongly iden-

tified as to date, place, and type. The man might better be called a "Ninety-Eighter."

How is it that a photograph taken in the 1890's by a Pasadena author is the most popular view of the Gold Rush era? Historians usually are meticulous in establishing the veracity of a document or book before substantiating a theory. Unfortunately, historical photographs have come under much less scrutiny. Too often, the historian or researcher is content to accept the identification written on the verso of the print without checking it himself.

This lesson in photographic historiography is intended to point out that the same rules of scholarship that apply to manuscripts and documents apply to photographs. The pictorial document must be investigated as to type (daguerreotype, ambrotype, tintype, wet-plate, dry-plate, etc.), date, and photographer. For example, one

library has attributed the photograph of the man panning for gold to the famed William Henry Jackson instead of James.

Credit for this stunning photograph must be given to Professor George Wharton James. The prolific chronicler of California and the Southwest was in his own right a fine amateur photographer. On his many trips to the Colorado Desert and Arizona, the bearded professor took along his dry-plate camera and recorded the land's magnificent scenery. Fortunately, the photographic work of James has been preserved in several research libraries in Southern California, including the Natural History Museum of Los Angeles County.

The prospector photograph is one of a series of views James made for his book *In and Around the Grand Canyon*, published by Little, Brown, and Company in 1900. On this particular expedition, James enlisted the guidance of explorer Ned Galloway to take him up to Glen and Marble Canyons. After rowing a considerable distance, the party came to a placer ground where James stopped to watch some miners pan for gold. In this group was the man that became the subject of the professor's famous photograph. According to James:

Several pans of gravel were washed, and as the gold settled in the bottom we estimated the value of the 'dirt' and found that each yard should bring in from three to ten dollars, and as there were many yards of gravel, the miners certainly had a good thing in that particular bar.

Professor James took several other views of Glen Canyon and the miners, including the other photo reproduced in this article, which is part of the Huntington Library collection. Unfortunately, the Pasadena author provided no information as to the identity of this rugged-looking grubstake prospector. The photograph is merely labeled: "Panning for Gold in Glen Canyon," copyright 1898. Thus the grizzled old man in this magnificent dry-plate photo will probably remain anonymous forever. One can be sure, however, that both photographer and miner had no idea that their acquaintance would result in a photograph that would one day be used as the typical Forty-Niner. □

Gary F. Kurutz is library director of the California Historical Society, San Francisco. He is also a Research Associate in History at the Natural History Museum of Los Angeles County.



The "Old Prospector" is in the center of this group photograph, taken the same day as the other picture. Huntington Library Collection photo.

Panning for Gold. This is the most popular photograph in the Natural History Museum of Los Angeles County Archives.



Shakespeare, Cowslips, and the Mole on Imogen's Breast

by William A. Emboden

*"The cowslips tall her pen-
sioners be;
In their gold coats spots
you see;
These be rubies, Fairy favours,
In those freckles live their
savours:
I must go seek some dewdrops
here, And hang a pearl in ever
cowslip's ear."*

Midsummer Night's Dream
(ii, I.)

It might seem inappropriate to single out Shakespeare as a writer preoccupied with botanical thought, but statistics on the frequency of botanical allusions in Shakespeare's writings confirm him as the one writer (in the lineage of great writers, excluding botanists as such) preoccupied with botanical thought. The primary purpose of his use of plants was to convey sentiments associated with them in order to describe individuals, their emotions and attitudes.

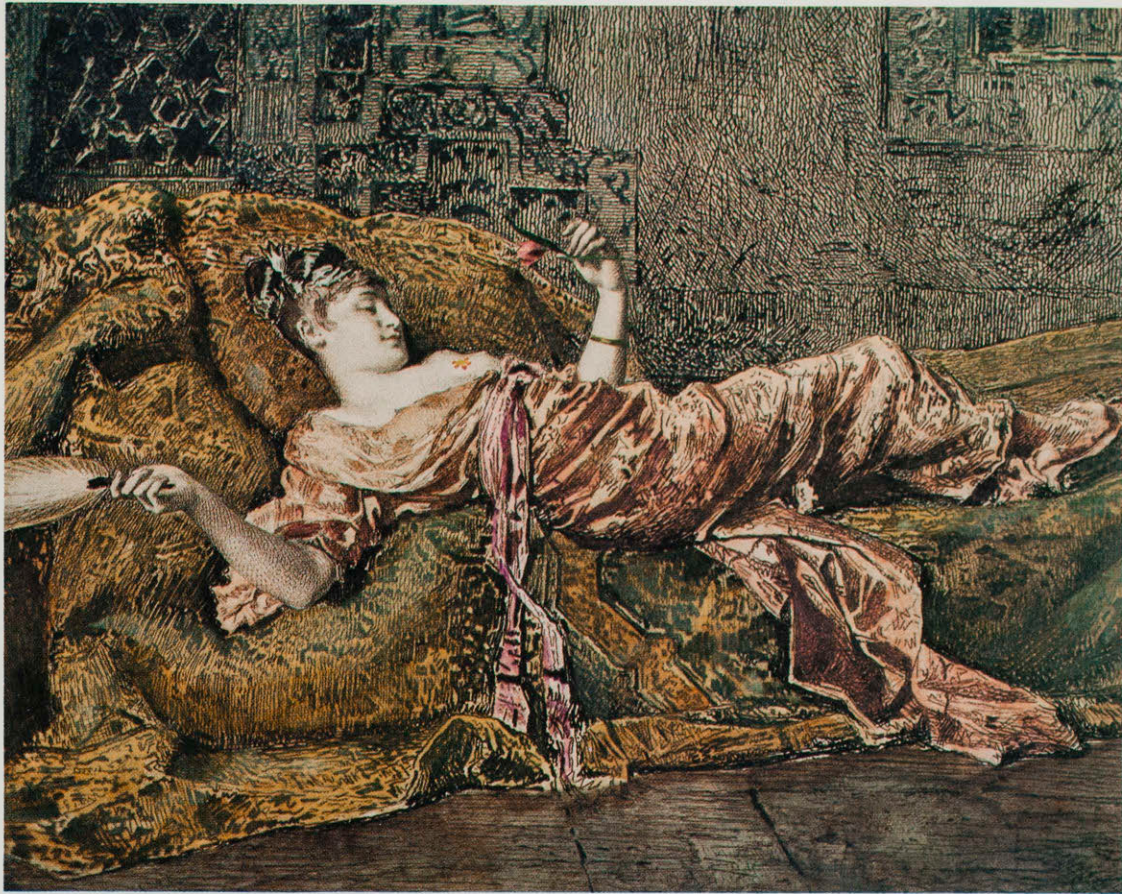
Shakespeare numbered apothecaries among his friends and was familiar with the purported medicinal virtues of plants as well as their poetic nuances. In some instances the idea associated with an herb or tree may be traced back to ancient Greek, Roman, and Hebrew traditions. Only the Old Testament exceeds Shakespeare in the number of plants mentioned in the text, and we know this work to be the compilation of many hands.

Among the classical writers Theocritus, Virgil, Chaucer, and Milton approach Shakespeare in the frequency of botanical entries in their tomes. Not one of these writers has been as accurate as Shakespeare in description of the plant and its habitat, nor have they been as scrupulous in appraising the histories of the associated sentiments.

Shakespeare used plants much as the painters of his time, as symbols which the reader (or viewer in the case of paintings) might readily interpret as expressive of a particular idea. The absence of plant allusions in the works of the other writers mentioned would alter their texts insignificantly. In the case of Milton it might well have improved upon his texts, certainly in *Comus* and *Lycidas* where his botanical accuracy leaves much to be desired.

I find it impossible to agree with L. H. Grindon, the noted authority on Shake-

speare's flora. When appraising Shakespeare's use of plant allusions he states: "Often there is no more than the barest mention (of the plant), and the word seems to serve no purpose but that of completing the measure." Shakespeare was scrupulous in his use of words, and the use of plant names is *never* capricious or merely used for the sake of meter or euphony. Grindon also maintains that Shakespeare erred in *Cymbeline* (1609-1610) — this, Grindon maintains, was his "one botanical lapse." In Act II, Scene 2 Imogen is lying half asleep (and half disrobed), Iachimo notes, "On her left breast, a mole cinque-spotted, like the crimson drops I' the bottom of a cowslip." Delighted in having found the one error in Shakespeare's botanical allusions, Grindon suggests that it may be a copyist's error (noting the horrendous inaccuracy of the first folio of 1623), and indeed this edition was fraught with error. Then he maintains,



Imogen: On her left breast a mole cinque spotted. This nineteenth-century engraving is reputed to have been retouched in color by Louise Abbema, known for her famous nude studies and her attention to anatomical details.

"... it is going quite beyond the reality to say that the spots in the cup of the cowslip are 'crimson.' The nearest approach to that colour ever seen could only be described as rosy orange. This in truth, is the only circumstance which justifies or even calls for the present comment." The appropriate comment must be that which vindicates Shakespeare.

"Cowslip" is a common name, and as with all common names it applied to a number of different plant genera and species, but that one which Shakespeare had in mind was undoubtedly *Primula veris* of the family Primulaceae. A description of this herb taken from Grieve (fide: *A Familiar Flora*):

"The sepals of the flower are united to form pale green crinkled bags from which the corolla projects, showing a gold disk

about 1/2 inch across the scalloped edges, the petals being united into a narrow tube within the calyx. On the yellow disk are five red spots, one on each petal." (*A Modern Herbal*).

This is the "cinque-spotted" or five-spotted condition of the mole on the breast of Imogen (which from the description would seem to be a sort of tumour). Now having vindicated Shakespeare of this one error, it would seem appropriate to explore his use of the cowslip beyond the simple similarity of an epidermal aberration on Imogen's left breast.

If Mr. Grindon in his *Shakespeare Flora* had made a sort of floral concordance, he would have noted that in *Henry the Sixth* (iii., 2) allusion is made to the spots of red on the primrose (cowslip):

"I would be blind with weeping, sick with groans,
Look pale as primrose,
with blood-drinking sighs,

And all to have the noble duke alive."

This is but one of eight references to the primrose (cowslip) to be found in the totality of Shakespeare's writings. Mr. H. N. Elacombe in his 1896 edition of *Plant Lore and Gardencraft of Shakespeare* is more thorough, but does not identify the cowslip as anything more than the genus *Primula*.

Perhaps the confusion was introduced by another passage in *Cymbeline* where the Queen (who is something of an apothecary and is suggestive of Elizabeth I in several respects) says:

"So, so, well done, well done:
The violets, cowslips, and
the primroses
Bear to my closet." (i., 6)



Primula Veris by Frances Runyan.

Here a distinction is made between the primrose and the cowslip. Primroses were not all called cowslips, just as not all cowslips were primroses. For example, in *A Winter's Tale*, "pale primroses" are mentioned. There is little doubt that this "pale primrose" was *Primula vulgaris* which like the cowslip (*Primula veris*) has a narcotic juice throughout the plant which is sedative; for this reason the Greeks knew the primrose as "*Paralysio*." As for the violet in the Queen's herbal gathering, it had the reputation of inducing sleep and was powerful against "wykked sperytis." This digression merely indicates the distinctions that might have been made by Grindon, but he believed, "Shakespeare was not a botanist; not a man skilled, that is to say, in the technical knowledge of plants."

Shakespeare chose a flower which had no negative connotations; in fact it was also known under such common names as "Key

of Heaven, Our Lady's Keys, Herb Peter," and other variations on these names. The drooping flowers of this plant suggest a bunch of keys, the emblem of Saint Peter at the gates of heaven (most interesting in the context of the position of Imogen's mole). It was also dedicated to Freya the "Key Virgin" in Norse mythology; it was the flower that was supposed to admit her to her treasure palace. This myth was then transferred to the Virgin Mary, becoming "Our Lady's Keys," and the "Key to Heaven." It was the Virgin, as well as St. Peter who could admit souls to Heaven. Thus Shakespeare has presented us with several clues as to Imogen and the view of that lady as seen by Iachimo. Contrary to the assertion of Grindon that Shakespeare was in error and that he sometimes used a botanical allusion to complete a metre, it is clear that this plant, like the hundreds of others, was used with unerring precision.

Using Grindon's own words: "Whoever else you may be disposed to quarrel with, never fall out with Shakespere (*sic*); not even over a verbal error, any more than, if you would prosper, over a rule of life. Discover the misprints by all means; amend everything that is clearly not Shakespere's own; but let the blemishes pass. Life is too short . . . There is no real skill or cleverness in discovering faulty (*sic*)."

As for the emblem of chastity, virginity, it is the very substance of the plot and the reputation of Imogen, daughter of Cymbeline. In fact, Act I, scene 4, makes much ado of this "virtuous, wise, chaste, constant, qualified" woman, into whose bed-chamber the clever Iachimo steals by concealing himself in a trunk.

It is interesting to note that the entire substance of this play derives from the *Decameron* of Giovanni Boccaccio (*The Second Day*, *The Ninth Novel*), "Wherein is de-

On Astrology and Other Sciences

(A propos the mutual birthday of Charles Darwin and Abraham Lincoln)

*Astrology, they tell us,
Is a science most exact,
Biology, we also know,
Is highly based on fact,
Geology, on the other hand,
Is anybody's guess,
And Paleontology, heaven knows,
Is always in a mess.*

*For every day they find new
Things that make a fact a lie,
They find a fish who couldn't swim,
A reptile who could fly,
And then they learn that they were wrong,
Where now is sea was land,
The fish could fly, the reptile swim;
Apes really came from man.*

*So all in all it makes you wonder
What we really know,
Today's today – that must be true.
No! Wait! It isn't so . . .
Today's tomorrow's yesterday;
It doesn't really last,
So all we know for certain sure –
We're living in the past.*

*We're victims of the Cosmos.
Our fate lies in the stars.
Astrologers will tell us
Our future isn't ours.
Charles Darwin thought he'd figured
Out that Nature causes change;
That things develop as they must
To live within their range.*

*He little knew that all his
Work was governed from Beyond,
A science greater than his own
Controlled him with a wand,
If he'd been born a minute sooner,
In a land across the waves,
Abe Lincoln might have gone to sea –
Charles might have freed the slaves.*

by **Jeanne Duque**
February 12, 1976

27



Primula Vulgaris by Frances Runyan.

clared that by overliberal commending the chastity of women it falleth out . . .” The character of Imogen is Zinerva and that of Iachimo is Ambrogiuolo. In the anonymous English translation of 1620 it is said of Ambrogiuolo, “No especial note or mark could he descry whereof he might make credible report, but only a small wart upon her left pap with some few hairs growing thereon appearing to be as yellow as gold.” Certainly Shakespeare refined this description by using the cowslip emblem.

It is strange that the foremost authority on the flora of Shakespeare restricted his interpretation of what the cowslip might have been, for at the time of his writing (1883) the cowslip of England was any of the following plants: *Gagea lutea* (Our Lady's Cowslip), *Caltha palustris*, *Impatiens biflora* and *Primula veris*. Had he investigated all of these he would have found in *Primula veris* the intent of the text and, “the solitary

Shakespearean botanical slip (which) like all his other lapses, so palpable as to be detected on the instant” would not have to be excised from his (Grindon's) text. Moreover the mole (wart) on Imogen's breast might have gone unnoticed. I hope, dear reader, that by these various and sundry digressions on Shakespeare, cowslips, and moles you will find yourself considerably amused if not altogether enlightened. □

William Emboden is currently completing a book on Shakespeare's plants.

HAIR SPLITTING

by Gretchen Sibley

28

At the close of a hectic day the phone rang for about the fiftieth time. "Miss Sibley, Mr. Wilson of Fish and Wildlife is here, should I send him down?" I told the security guard to let him in and in a few minutes Mr. Wilson arrived, struggling under the weight of a box almost as big as a coffin. It was a shipment from Paris, ordered by a furrier in Central California. Inside were six beautiful coats, soft suede camel skin with lovely reddish brown fox fur collars, but alas! — lined with what looked like ocelot fur. I took a few hairs from various parts of the pelts of all six coats and helped Mr. Wilson carefully repack them. That night the hairs were cleaned, cleared and mounted and laid aside to dry for further study. Cat pelts and hairs are difficult to identify and sometimes many hours of work are required for positive identification. Unfortunately, for the importer, these hairs without doubt proved to be from ocelots and the coats were confiscated.

This was the most recent of innumerable hair and fur problems brought in during a span of many years. The study began in 1947 as I was walking down the hall of the third floor of the Museum. Dr. Pierce, Curator of Entomology, called out to me: "Gretchen, do you know anything about hair?" and I answered that all I knew was that it got in the way when cutting tissue for

microscopic study. Dr. Pierce had just begun his interesting work of soaking the many saber tooth cat skulls from the La Brea collection to find insect remains from Pleistocene times. He would soak the skulls for several months until the asphalt softened; the material was then drained and screened to reveal all kinds of small plant and animal parts. Among these parts he was finding small pieces of hair. Curiosity took over and led to my avocation as a research trichologist (science of the study of hair).

In order to study fossil material, it is necessary to know as much as possible about similar material in organisms now in existence. The first step in the study was to collect hair samples from animals related to those found in the pits. The Museum mammal collection provided a great treasury and many hours were spent carefully plucking hairs from study skins, labeling and preparing slide mounts for microscopic study. But, of course, life is never that simple . . . we don't have skins of all species of mammals. The San Diego Zoo was the next area of exploration. Ruth Mahood, former chief of the history division, and I started off on "safari" to the zoo. She was equipped with several loaves of bread and I with numerous envelopes and the blessing of Belle Benchley, Director of the zoo. In those days

there were only wire fences between man and animal, so Ruth would entice our prey to the fence with a slice of bread, holding off a little till the animal was walking along against the fence. While she fed one end, I plucked from the other. The animal keepers were also pulled into the project to collect material from those animals more likely to eat us than the bread.

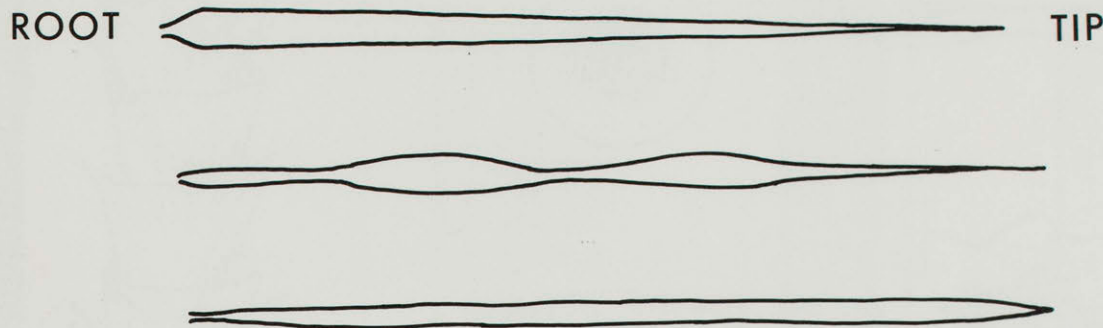
Because the County does not employ me to study hair, a lab was set up at home and the project was well under way. Fossil hair presents a number of problems. Rarely is the entire hair found and it is usually isolated from other hairs and from its animal source. And this was museum material which must always be catalogued with a number. Each hair was put in a gelatin capsule and both halves numbered. Capsules are slippery so a number are encased in vials for easy storage. In time the hairs were to be mounted, but techniques of study and care had to be searched out and perfected lest the specimens be destroyed.

Perhaps by now you are wondering what can be seen in a hair. It is composed of all sorts of interesting structures, the combination of which provide the clues for identification.

The general shape of the hair is the first thing to observe. Some hairs are very thick at the base, gradually tapering to a point.

GENERAL SHAPE OF HAIR

Fig. 1



Sometimes the point is acute and at other times it narrows gradually. On the other hand the hair may emerge from the root or follicle as a slender shaft, widening and narrowing several times (see figure 1). The cross section of hair may also reveal differences. Straight hairs are round in cross section, curly hairs flattened. Members of the rabbit family have hairs flattened in the middle producing a dumbbell shape in cross section, while a sloth hair is star-shaped. To find this characteristic the hair is placed in soft wood and a thin cross-section is cut and mounted on a microscope slide for study (see figure 2). Fortunately, experience soon enables one to determine the design of the cross section without going to all that trouble.

Hair has three layers, each contributing more to help the investigator. The outer layer is called the *cuticle* and is composed of scales which lie along the shaft of the hair very much like shingles on a roof. Sometimes these scales are long and slender and placed side by side around the shaft, while others may be short but broad and a single scale may wrap itself completely around the shaft (see figure 3). Of course, there are many shapes and patterns and the pattern may even vary on the hair itself. In other words, the scales may change their shape as the hair is developed in the follicle.

This tendency makes the bits of fossil hair difficult to classify. One does not know whether the piece came from near the root, the middle or the tip. Just to make things more difficult, once a hair is mounted for study, the scales cannot be seen. Thus a plastic impression must be made before mounting the hair. The hair is placed between sheets of plastic, clamped tightly and heated till the plastic is soft enough to receive an impression of the scales on the hair. The thin sheets of plastic can be mounted on a microscope slide and the scales easily studied and measured.

Just inside the cuticle is a layer called the *cortex*. This is composed of fibers running the length of the hair and may contain pigment granules, a diffused pigment and long slender air spaces. The relative widths and pockets in this area are also distinctive. Pigment granules may be small or large, clump, chain or occur singly but are always characteristic of the species (see figure 4).

Finally, the middle of the hair is called the *medulla*. It is composed of cells filled with air. Sometimes the cells are found only occasionally along the shaft, sometimes they are small, sometimes large, sometimes rounded and sometimes flattened together like pancakes (see figure 4).

All these differences lead to difficult detective work at times. And just to make it

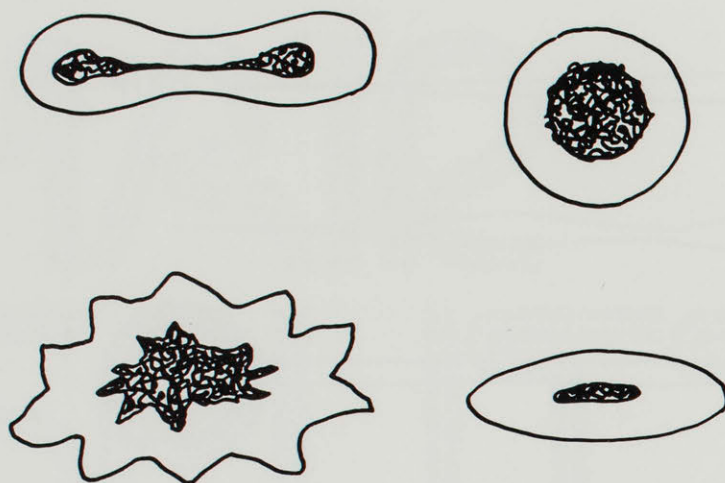
more intriguing, many animals have two kinds of hair which also have differences. There may be long guard hairs which are those visible when one looks casually at the animal and the other hairs form a fine underfur lying close to the skin. Fur is merely a term applied to fine hair.

When techniques were perfected it was possible to begin the study of fossil hair, not only from La Brea pits but from frozen mammoths and rhinos from Siberia, ground sloths from Patagonia and miscellaneous bits from various fossil localities around the world.

However, some of the most interesting problems have emerged from the desks of the curators, from legal cases and from government agencies. Robert Ariss, former Curator of Anthropology for many years to the Museum, kept me busy identifying hairs from the shrunken heads prepared by the Jivaro Indians of South America. Anthropologists and serious students occasionally bring in good specimens and tourists are gullible for the hideous fakes produced by the industrious Latin Americans. In addition to these, many old artifacts contain bits of skin with hair attached, and some bones may have skin and hair dried to the surface. Even woven pieces may contain animal hairs which reveal more of the life habits of ancient peoples.

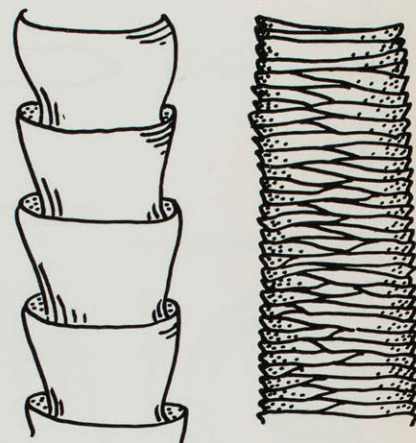
VARIATION IN CROSS SECTION

Fig. 2



VARIATION IN SCALE STRUCTURE

Fig. 3



In his later years, Dr. Pierce began a study of nodules formed in ancient seas of the present Southern California deserts. Nodules are mineral deposits which form around hard objects in the water. His principal interest was the insects he found inside the nodules, but he often found hairs in his material. He mounted these and finally had a box of one hundred slides which he presented to me for study. He was certain that he had found hairs of fossil animals, but examination proved them to be hairs which fell from Dr. Pierce's head as he bent over his work! He was so disturbed by this revelation that he could hardly accept the identification and may have died still thinking he had found the hair from four-legged beasts among his insects. A similar experience occurred when a research team from the University of Southern California brought in several boxes of prepared slides containing hairs found in ice cores from the Arctic. The scientists were excited because some of the hairs were red and some blue. The explanation was easy, for the men had been wearing colored woolen sweaters while working over the cores in the Arctic.

Most of the problems brought in are legal cases. A few months ago a lawyer called; his client had bitten into a tamale and found something hard and hairy. She had im-

mediately taken it to the lawyer, certain that it was from a rat. A little study proved it to be a bit of skin and hair from poorly butchered lamb. Similar samples from hamburger are brought in from time to time, but these are usually cowhide with hair attached.

On another occasion the police department called for the identification of a few hairs found in a large hollow belt worn by a suspected thief. He had visited a furrier, hidden mink pelts in the belt and walked off with them. Of course, there were no pelts to be seen when he was captured, but the tell-tale hairs clung to the inside of the belt to convict him.

Only rarely is human hair sent in, for humans all belong to the same species and it is not possible to use hair for positive identification. However, there are racial characteristics which may be helpful. For example, it was once necessary to check the hair from a decomposed body because the man was thought to be an Oriental. These people have very dark coarse hair, but the same type of hair may be found on other peoples. Negroid races tend to have tight curly hair, but this type also is occasionally found among other peoples, and the intermarriage of Negroid with other races may change the hair characteristics of offspring.

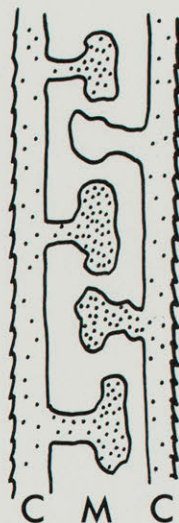
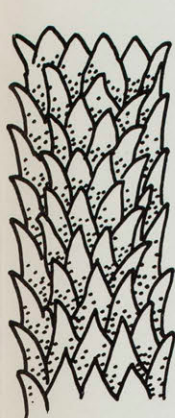
Because people are impressed with the names of choice hair and fur, pelts are not always given their proper names. Even brushes are mislabeled to bring higher prices. In particular, cosmetic and paint brushes are often misrepresented. The best fine brushes are made from expensive red sable. Importers take advantage of this by using cheaper hair or mixing cheaper hairs with the more expensive sable. The only way to be certain of some of these mixtures is a microscopic examination.

Most of the work brought in is from the Department of Fish and Wildlife. Checking illegal hunting occupies much of their time. Hunters are clever and take great pains to hide the fact that they have been hunting out of season or killing protected animals. Meat is removed from bones, skins tanned and declared to be old pelts from grandfather's collection, or stories told of killing to protect human life. Sometimes it is impossible to break these cases, but there may be revealing evidence upon careful investigation of hair samples.

The greatest haul for Fish and Wildlife comes from the U. S. Customs, ever alert to the wiles of the tourist or importer. Since cat hair is prized for adornment, many articles are purchased abroad as trophies from a tourist's latest holiday. Leopard-skin wal-

VARIATION IN CORTEX AND MEDULLA

Fig. 4



lets, tigercat jackets, ocelot collars and lion-skin purses are some of the more popular items confiscated after positive hair examination. Since there is often great variation in pattern within a species of cat, careful microscopic examination is necessary. While the tourist is inclined to be ignorant of the law, importers seldom are and attempt to escape detection by changing the names of the skins they import.

One of the biggest problems in the past few years has arisen by an attempt to protect the South American vicuña, a rare wild animal of the high Andes. These members of the camel family, related to the llama, guanaco and alpaca, have a much finer fur than their three relatives. Only a few hundred of the vicuña are left and these are usually allowed to roam the great high meadows along with the llama. Since they are now protected by law, the United States will not allow vicuña fur to be brought into this country. Since most tourists return with something made of llama fur, the customs people are concerned that the item might be made of vicuña. I have worked out a simple system of identification which has been printed and sent to all ports of entry. This had just been published when a new problem arose. Merchants in Hong Kong found it easier to sell a cloth coat labeled as

made from woven vicuña hair. To our knowledge vicuña hair has never arrived in Hong Kong, but the coats pose a great problem to U. S. Customs.

There is no literature one might use to help in identifying many kinds of hair and fur, and it is often necessary to compare unknown hairs with those positively identified. Museums and zoos are the sources of hair samples, but no one institution contains all species of animals and sometimes it is difficult to find specimens. A recent Japanese shipment of hair pieces, consisting of saucy white curls labeled as yak hair, resulted in widespread communication with Eastern museums in search of yak hair. The hair was found and further study identified the curls to be bleached hair from cowhide imported to Japan.

There are elements of adventure and anticipation in museum work. While I am training docents, preparing research notes or testing students, a shipment may arrive from Africa, Fish and Wildlife may drop by with a confiscated fur coat from South America or the mail may bring a few whale bristles! A casual question asked twenty-eight years ago has resulted in a fascinating and useful research. □

This article culminates several years of research by Gretchen Sibley, one of TERRA's most faithful contributors.

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